Print ISSN: 2321-6379
Online ISSN: 2321-595X

Original Article

Seroprevalence of Total Antibodies to Severe Acute Respiratory Syndrome Coronavirus 2 in Health Care Workers at a Secondary Care Hospital in Southern India

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Abstract

Introduction: Seroprevalence studies in healthcare workers (HCWs) make it possible to assess the level of exposure, and indirectly, the effectiveness of the implemented protective measures. They are also crucial as an aid to health care resource planning to provide a safe environment to protect both patients and HCWs from severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection.

Aim: To study the seroprevalence of total antibodies against coronavirus disease 2019 (COVID-19) infection among HCWs.

Materials and Methods: In this prospective study, 257 health workers from a secondary care hospital in South India were voluntarily participated to test total antibodies. All participant's name, age, gender, and history of COVID infection were collected. A total SARS-CoV-2 antibody (both IgG and IgM) was measured in all participants.

Results: In this study 257 HCWs were screened for COVID-19 IgG antibody. A total of 111 HCWs (43%) were positive for the covid-19 antibody. A total of 198 HCWs with known reverse transcription-polymerase chain reaction negative, 31.8% of them developed antibodies. The seroprevalence of SARS-CoV-2 total antibodies in HCWs with no prior infection in our study was 24.5% (63/257).

Conclusion: The increasing trend in seroprevalence over time reflected an increase in the spread of SARS-CoV-2 in the community and an increase in exposure duration as the pandemic progressed.

Key words: Healthcare workers, High risk, Immunoassay, Pandemic, Seroprevalence, Severe acute respiratory syndrome coronavirus 2

INTRODUCTION

India has a high burden of coronavirus disease 2019 (COVID-19), a novel disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[1] In March 2020, the World Health Organization (WHO) declared the COVID-19 outbreak a global pandemic.[2] In <5 months, it had spread to all States and Union Territories in India and posed a challenge for the healthcare system worldwide.

SARS-CoV-2 poses a high occupational risk to healthcare workers (HCWs), who are at the forefront of the management of COVID-19 cases in hospital settings. Knowledge of the burden of infection among HCWs is important to gauge the risk of within and outside hospital transmission of SARS-CoV-2 and evaluate in-hospital infection control practices and adherence to non-pharmaceutical interventions.

Since its emergence, SARS-COV-2 has become a global health threat, By late January 2020, the Center for Disease Control (CDC) china reported 16 HCWs affected by contacts with patients, it was speculated that HCW infection could

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www.ijss-sn.com

Month of Submission : 06-2021
Month of Peer Review : 07-2021
Month of Acceptance :07-2021
Month of Publishing : 08-2021

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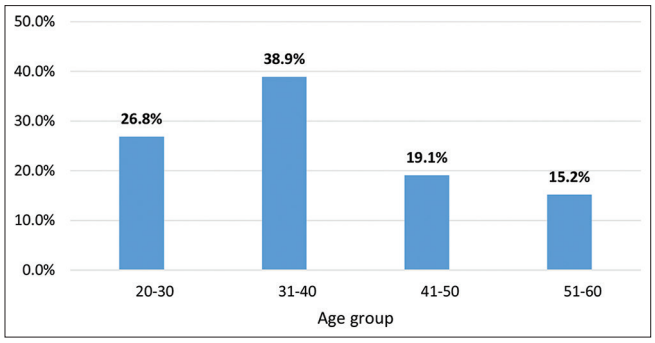

Figure 1: Age group distribution

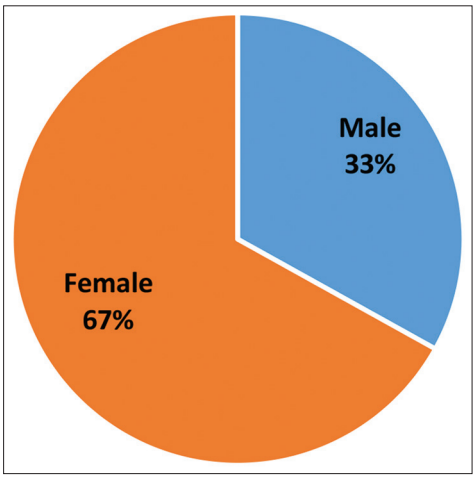

Figure 2: Gender distribution

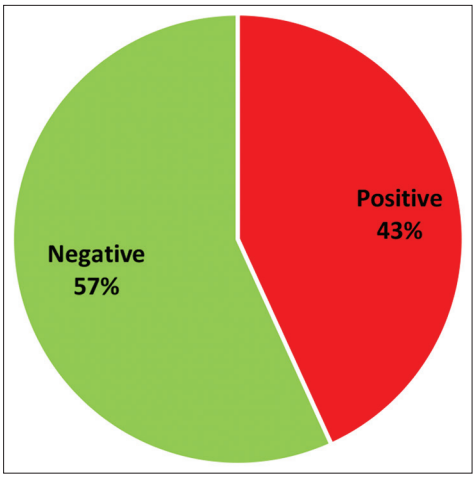

Figure 3: Total Antibodies results distribution

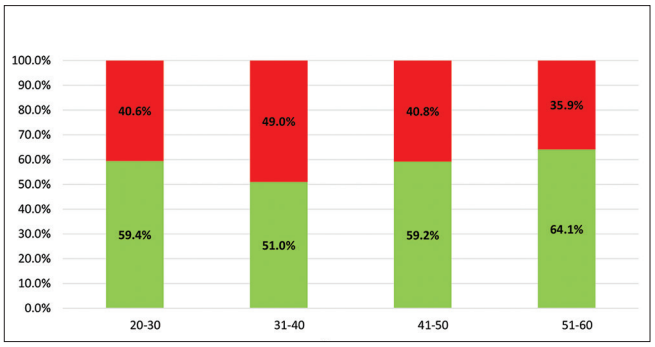

Figure 4: Total antibody positive in age groups

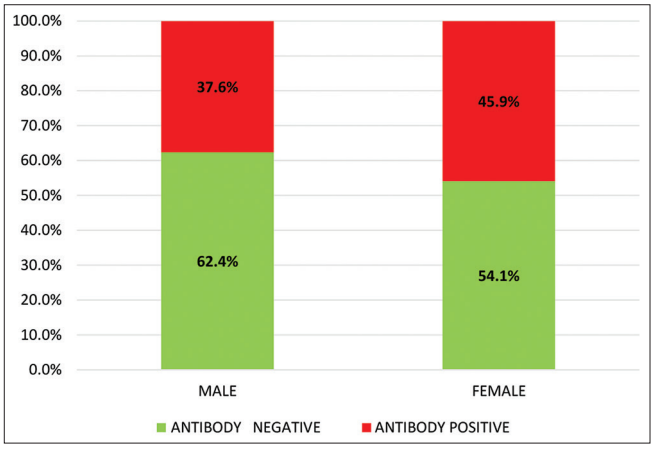

Figure 5: Total antibody positive in gender

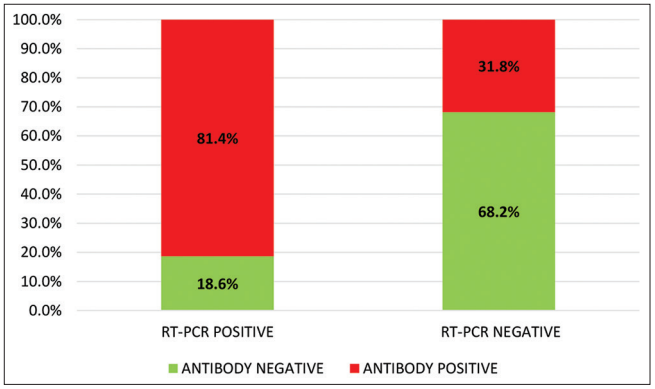

Figure 6: Total antibody positive in previous reverse transcription-polymerase chain reaction positive cases

potentially contribute to exacerbating chain of transmission in hospital and other facilities, and therefore proper protection of HCWs against COVID-19 by mandating protective protocols had been prioritized. HCWs often had to care for patients with suspected or confirmed COVID-19 infections without proper equipment, This contributed to increased risk to HCWs during the pandemic.[3-5]

Some studies say that working in COVID specialty care is not associated with increased risk of COVID infection, possibly owing to protection afforded by high-level PPE or decrease in infectivity that occurs in later stages of the illness, even among critically ill patients.[6-8] In this study, we assess the antibody titer to COVID-19 infection due to easy affordability and faster results but there is uncertainty whether prior clearance of SARS-CoV-2 is truly protective.

Table 1: Cross-tabulation of Total antibody with RT-PCR findings

RT-PCR	Total antibody		Total
	Positive	Negative	
Positive	48	11	59
Negative	63	135	198
Total	111	146	257

RT-PCR: Reverse transcription polymerase chain reaction

Aim

To study the seroprevalence of total antibodies against COVID-19 infection among HCWs.

MATERIALS AND METHODS

This cross-sectional study was conducted in the department of general medicine at the Government district headquarters hospital, Virudhunagar from September 2020 to October 2020 in 257 HCWs irrespective of previous reverse transcription polymerase chain reaction (RT-PCR) status. Inclusion criteria: physicians, nursing staff, technical staff, and paramedical staff, sanitary workers, and office staff were invited to participate voluntarily. All participant's name, age, gender, and history of COVID infection were collected. A total SARS-CoV-2 antibody (both IgG and IgM) was measured in all participants. Data were collected and presented as frequency and percentage.

RESULTS

In this study, 257 HCWs were screened for COVID-19 Total antibodies. The highest number of HCWs are in the age group of 31–40 years followed by 20–30 years [Figure 1]. In this study 67% of HCWs are female and 33% of HCWs were male [Figure 2]. A total of 111 HCWs (43%) were positive for the COVID-19 antibody [Figure 3]. There is no difference in the age group among 111 HCWs positive for the COVID-19 antibody [Figure 4]. In 85 male HCWs, 37.6% were positive, and in 172 female HCWs, 45.9% were positive for the COVID-19 antibody [Figure 5]. A total of 59 HCWs has known RT-PCR positive cases, 81.4% of HCWs developed antibodies and 18.6% of them have not developed antibodies. A total of 198 HCWs with known RT-PCR negative, 31.8% of them developed antibodies [Figure 6 and Table 1]. The seroprevalence of SARS-CoV-2 total antibodies in HCWs with no prior infection in our study was 24.5% (63/257).

DISCUSSION

Population-based serosurveys are recommended to estimate the proportion of a population already infected with SARS-CoV-2. Seroprevalence studies in HCWs make it possible to assess the level of exposure, and indirectly, the effectiveness of the implemented protective measures. They are also crucial as an aid to health care resource planning to provide a safe environment to protect both patients and HCWs from SARS-CoV-2 infection. Repeated cross-sectional serosurveys conducted in the same geographical location provide estimates to monitor trends over a period of time.[9] Information from repeated cross-sectional surveys is valuable for public health decision-makers to design and revise containment strategies. A meta-analysis undertaken by Chen *et al.* estimated that the overall global seroprevalence of SARS-CoV-2 was 8.0% in the general population and 17.1% among HCWs.[10]

In our study, the seroprevalence rate was higher than that reported in studies from Italy (0.7% [15/2057]),[11] Germany (1.6% [5/316] by Korth *et al.*[12] and 2.7% by Schmidt *et al.*[13]), Denmark (4·04% [1163/28792]),[14] North-West England (6% [17/281]),[15] Belgium (6.4% [197/4125]),[16] Sweden (6.6% [577/8679]),[17] and Spain (5.9% by Martín *et al.*[18] and 9.3% [54/578] by Garcia-Basteiro *et al.*[19]); similar to the studies from Egypt (12.2%)[20] and Italy (14.4% by Sotgiu *et al.*[21]) and lower than that reported from the UK (18%)[22] and the USA (36%).[23] Comparison of serosurveillance data between HCWs and the National CDC showed significantly higher seroprevalence in the community than in HCWs at our institute.[24]

In India, several cities and states have conducted serosurveys. Metropolitan cities such as Delhi, Mumbai, Pune, Chennai, Ahmedabad, and Hyderabad have reported seroprevalence ranging between 17.6% and 56% at different time points. Tamil Nadu and Kerala conducted serosurveys covering all districts in October–November 2020 and February 2021, respectively. Seroprevalence reported in Chennai, Coimbatore, and Tiruvannamalai districts of Tamil Nadu were comparable to the present survey. The higher seroprevalence in Palakkad, Ernakulam and Thrissur districts of Kerala found in the present survey compared with the Kerala serosurvey could be due to the use of assays for antibodies against the N-protein alone in the Kerala serosurvey.[25]

CONCLUSION

The increasing trend in seroprevalence over time reflected an increase in the spread of SARS-CoV-2 in the community and an increase in exposure duration as the pandemic progressed. Our study provides data on the seroprevalence of SARS-CoV-2 infection among HCWs in a secondary care hospital during the pandemic, which can be used to inform future COVID-19 pandemic control and prevention strategies.

REFERENCES

1. Sahoo H, Mandal C, Mishra S, Banerjee S. Burden of COVID-19 pandemic in India: Perspectives from health infrastructure. medRxiv 2020;2020:20113456.
2. World Health Organization. WHO Director-General's Opening Remarks at the Media Briefing on COVID-19 11 March 2020. Geneva: World Health Organization; 2020. Available from: https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020. [Last accessed on 2021 Jun 12].
3. Nguyen LH, Drew DA, Graham MS, Joshi AD, Guo CG, Ma W, *et al.* COronavirus Pandemic Epidemiology Consortium. Risk of COVID-19 among front-line health-care workers and the general community: a prospective cohort study. Lancet Public Health 2020;5:e475-83.
4. Kua J, Patel R, Nurmi E, Tian S, Gill H, Wong DJ, *et al*. healthcare COVID: A national cross-sectional observational study identifying risk factors for developing suspected or confirmed COVID-19 in UK healthcare workers. PeerJ 2021;9:e10891.
5. Zhang Z, Liu S, Xiang M, Li S, Zhao D, Huang C, *et al*. Protecting healthcare personnel from 2019-nCoV infection risks: Lessons and suggestions. Front Med 2020;14:229-31.
6. Eyre DW, Lumley SF, O'Donnell D, Campbell M, Sims E, Lawson E, et al. Differential occupational risks to healthcare workers from SARS-CoV-2 observed during a prospective observational study. Elife 2020;9:e60675.
7. van Kampen JJ, van de Vijver DA, Fraaij PL, Haagmans BL, Lamers MM, Okba N, *et al*. Duration and key determinants of infectious virus shedding in hospitalized patients with coronavirus disease-2019 (COVID-19). Nat Commun 2021;12:1-6.
8. SARS-CoV-2 IgG. Available from: https://www.fda.gov/media/137383/download. [Last accessed on 2021 Aug 18].
9. World Health Organization. Population-based Age-stratified Seroepidemiological Investigation Protocol for Coronavirus 2019 (COVID-19) Infection, 26 May 2020. Geneva: World Health Organization; 2020. Available from: https://apps.who.int/iris/handle/10665/332188. [Last accessed on 2021 Aug 18].
10. Chen X, Chen Z, Azman AS, Deng X, Sun R, Zhao Z, *et al*. Serological evidence of human infection with SARS-CoV-2: A systematic review and meta-analysis. Lancet Glob Health 2021;9:e598-609.
11. Lahner E, Dilaghi E, Prestigiacomo C, Alessio G, Marcellini L, Simmacoș M, *et al*. Prevalence of SARS-CoV-2 infection in health workers (HWs) and diagnostic test performance: The experience of a teaching hospital in Central Italy. Int J Environ Res Public Health 2020;17:4417.
12. Korth J, Wilde B, Dolff S, Anastasiou OE, Krawczyk A, Jahn M, *et al*. SARS-CoV-2-specific antibody detection in healthcare workers in Germany with direct contact to COVID-19 patients. J Clin Virol 2020;128:104437.
13. Schmidt SB, Grüter L, Boltzmann M, Rollnik JD. Prevalence of serum IgG antibodies against SARS-CoV-2 among clinic staff. PLoS One 2020;15:e0235417.
14. Iversen K, Bundgaard H, Hasselbalch RB, Kristensen JH, Nielsen PB, Pries-Heje M, *et al*. Risk of COVID-19 in health-care workers in Denmark: An observational cohort study. Lancet Infect Dis 2020;20:1401-8.
15. Poulikakos D, Sinha S, Kalra PA. SARS-CoV-2 antibody screening in healthcare workers in a tertiary centre in North West England. J Clin Virol 2020;129:104545.
16. Steensels D, Oris E, Coninx L, Nuyens D, Delforge ML, Vermeersch P, *et al*. Hospital-wide SARS-CoV-2 antibody screening in 3056 staff in a tertiary center in Belgium. JAMA 2020;324:195-7.
17. Lidström AK, Sund F, Albinsson B, Lindbäck J, Westman G. Work at inpatient care units is associated with an increased risk of SARS-CoV-2 infection: A cross-sectional study of 8679 healthcare workers in Sweden. Ups J Med Sci 2020;125:305-10.
18. Martín V, Fernández-Villa T, Gil de Gomez ML, Mencía-Ares O, Rivero Rodríguez A, Celada SR, *et al*. Prevalence of SARS-CoV-2 infection in general practitioners and nurses in primary care and nursing homes in the healthcare area of León and associated factors. Semergen 2020;46 Suppl 1:35-9.
19. Garcia-Basteiro AL, Moncunill G, Tortajada M, Vidal M, Guinovart C, Jiménez A, *et al*. Seroprevalence of antibodies against SARS-CoV-2 among health care workers in a large Spanish reference hospital. Nat Commun 2020;11:3500.
20. Kassem AM, Talaat H, Shawky S, Fouad R, Amer K, Elnagdy T, *et al*. SARS-CoV-2 infection among healthcare workers of a gastroenterological service in a tertiary care facility. Arab J Gastroenterol 2020;21:151-5.
21. Sotgiu G, Barassi A, Miozzo M, Saderi L, Piana A, Orfeo N, *et al*. SARS-CoV-2 specific serological pattern in healthcare workers of an Italian COVID-19 forefront hospital. BMC Pulm Med 2020;20:203.
22. Pallett SJ, Rayment M, Patel A, Fitzgerald-Smith SA, Denny SJ, Charani E, *et al*. Point-of-care serological assays for delayed SARS-CoV-2 case identification among health-care workers in the UK: A prospective multicentre cohort study. Lancet Respir Med 2020;8:885-94.
23. Mansour M, Leven E, Muellers K, Stone K, Mendu DR, Wajnberg A. Prevalence of SARS-CoV-2 antibodies among healthcare workers at a tertiary academic hospital in New York City. J Gen Intern Med 2020;35:2485-6.
24. Sero-Prevalence Study Conducted by National Center for Disease Control NCDC, MoHFW, in Delhi, June; 2020. Available from: https://www.pib.gov.in/PressReleasePage.aspx?PRID=1640137. [Last accessed on 2021 Aug 18].
25. Murhekar MV, Bhatnagar T, Thangaraj JW, Saravanakumar V, Kumar MS, Selvaraju S, *et al*. SARS-CoV-2 seroprevalence among the general population and healthcare workers in India, December 2020 January 2021. Int J Infect Dis 2021;108:145-55.

How to cite this article: Anbuvel N. Seroprevalence of Total Antibodies to Severe Acute Respiratory Syndrome Coronavirus 2 in Health Care Workers at a Secondary Care Hospital in Southern India. Int J Sci Stud 2021;9(5):153-156.

Source of Support: Nil, **Conflicts of Interest:** None declared.